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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,155	07/09/2003	Won-Ho Lee	29926/39502	9764

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MARSHALL, GERSTEIN & BORUN LLP
6300 SEARS TOWER
233 S. WACKER DRIVE
CHICAGO, IL 60606

EXAMINER

HU, SHOUXIANG

ART UNIT PAPER NUMBER

2811

DATE MAILED: 03/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/616,155

Applicant(s)

LEE, WON-HO

Examiner

Shouxiang Hu

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>20030709</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the subject matter of "performing an additional ion-implantation process onto the exposed substrate surface" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. It is noted that in Fig. 2D, the additional ion-implantation process is not performed on an exposed substrate surface.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities and/or defects:

On page 7, lines 21 and 12, and at other places in the specification, the symbols that have a number (1 or 2) in a circle are not quite clear.

On page 7, line 26, the term of "after" apparently should read as: --before--, in view of Fig. 2D.

Appropriate correction is required.

Claim Objections

3. Claims 1-4 are objected to because of the following informalities and/or defects:

In claim 1, as two steps of removing a portion of the pad nitride layer are recited, the removed portions of the pad nitride layer should be recited as a first portion and a second portion, respectively, in order to avoid potential confusions between the two steps of removing.

In addition, claim 1 recites the subject matters of forming the "pad nitride layer" and twice using "the pad nitride layer as a mask", but fails to reflect the subject matters of the instant invention that a portion of the pad nitride layer has been removed before each use of it as the mask.

Furthermore, in claim 1, the term "partial portion" should read as: --second portion--; "one side" as: --a side surface--; and "spaced out" as: --retreated--, or as: --offset--.

In claim 2, the term of "at the step of removing the portion of the pad nitride layer is performed in a manner that the pad nitride layer is spaced out with the predetermined distance from the edge of the filed insulation layer" should be deleted, as the subject matter is already included in claim 1.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the

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art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-4 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites the subject matters of, following the removal of a second portion of the pad nitride layer, "performing an additional ion-implantation process onto the exposed substrate surface". However, according to what is described in the specification and the drawings (especially see Fig. 2D), the additional ion-implantation process is not performed on an exposed substrate surface, as it is covered by an oxide layer (11 and FOX).

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the term of "forming the field insulation layer by performing a channel stop ion-implantation process to the exposed substrate with use of the pad nitride layer"; but it fails to clarify the subject matters that the resulting channel stop region itself is not the "field insulation layer" intended to be formed; and that the field

insulation layer is formed of an insulation material according to the specification, instead of being formed of the doped channel stop region as seemly implicated in the claim.

8. In claims 3 and 4, there are two ion-implantation processes recited in claim 1.

And, claims 3 and 4 each fail to clarify which of the two ion-implantation processes the term of "the ion-implantation process" intends to refer to.

9. Claims 1-4 are further rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the field insulation layer is located at a periphery of the recited photodiode. Clarification of such relationship is critical as the intended objectives of the instant invention (including the diminishing of the dark leakage) would not be achievable is such relationship were not meet.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 1-4, insofar as being in compliance with 35 U.S.C. 112 and as being best understood in view of the claim objections above, are rejected under 35 U.S.C. 103(a)

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as being unpatentable over Pan (US 6,351,002) in view of Ida (JP 5-283404, 10/1993) and/or Yabu (US 5,128,274).

Pan discloses a method for isolating a hybrid device in an image sensor including a photodiode (204), the method (see Figs. 1-3) comprising the steps of: forming a field insulation layer (210) overlying a P-type channel stop layer region (220), and forming an additional P-type channel stop region (260) extended from the channel stop region (220).

Pan does not expressly disclose that the method involves a pad oxide layer and a pad nitride layer with two steps of removing of the pad nitride layer each followed by an ion-implantation process.

However, as evidenced in Ida (see Figs. 3a-3d), one of ordinary skill in the art would readily recognize that the forming of the field insulation layer (24) and the underlying channel stop region (26) commonly includes the steps of forming sequentially a pad oxide layer (22) and a pad nitride layer (23) on a substrate (21) and selectively removing a first portion of the pad oxide layer and a first portion of the pad nitride layer to expose a surface of the substrate in which a field insulation layer will be formed; forming the field insulation layer (24) after performing a first channel stop ion-implantation process to the exposed substrate with use of the remaining pad nitride layer after the removal of the first portion of the pad nitride layer as a mask. And, as evidenced Yabu (see Figs. 2c-2D), one of ordinary skill in the art would also readily recognize that the extended channel stop region can be readily formed with process simplicity through the steps of removing a second portion of the pad nitride layer (13) so

that a side surface of the pad nitride layer (13) is retreated with a predetermined distance from an edge of the field insulation layer, and performing a second channel stop ion-implantation process onto the substrate and the field insulation layer with the remaining pad nitride layer functioning as at least of a part of the implantation mask.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Ida's steps of forming the field insulation layer with an underlying channel stop region and Yabu's steps of forming an extended channel stop region into the method of Pan, so that a method for forming a image sensor with process simplicity would be obtained.

Regarding claim 2, it is noted that ordinary skill in the art would readily recognize that the offset distance would be directly correlated with intended size of the extended channel stop region, which is art-recognized parameter of importance subject to routine experimentation and optimization.

Regarding claims 3 and 4, it is noted that boron is art-recognized common dopant for P-type doping; that the implantation energy and dosage are both art-recognized parameters subject to routine experimentation and optimization; and that the recited implantation energy and dosage are both well within the commonly recognized respective ranges in the art for forming a channel stop region.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References C-G, N and O are cited as being related to the formation of a channel stop region.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
March 17, 2004


SHOUXIANG HU
PRIMARY EXAMINER